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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
COOKE, COLLEEN P	

ART UNIT	PAPER NUMBER
1754	

DATE MAILED: 06/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/031,724	SUN ET AL.	
	Examiner	Art Unit	
	Colleen P. Cooke	1754	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 March 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-27* is/are pending in the application.

4a) Of the above claim(s) *17-27* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16* is/are rejected.

7)☒ Claim(s) *11* is/are objected to.

8)☒ Claim(s) *1-27* are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *3/29/05,5/1/02,4/22/02*
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Election/Restrictions

Restriction is required under 35 U.S.C. 121 and 372.

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1.

In accordance with 37 CFR 1.499, applicant is required, in reply to this action, to elect a single invention to which the claims must be restricted.

Group I, claim(s) 1-16, drawn to a process of reducing NOx.

Group II, claim(s) 17-27, drawn to an apparatus for treating exhaust gas.

The inventions listed as Groups I and II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: The features in common between the two groups are no special technical features because they do not define over the prior art (Yamaguchi 5282355 which teaches at least the process).

During a telephone conversation with Thaddius Carvis on 5/16/05 a provisional election was made with traverse to prosecute the invention of Group I, claims 1-16. Affirmation of this election must be made by applicant in replying to this Office action. Claims 17-27 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Claim Objections

Claim 11 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 11 depends directly from claim 11 which requires "introducing an aqueous solution of urea" and therefore may not be further modified to be solid urea.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 13 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 13 recites the limitation "said side steam" in line 1. There is insufficient antecedent basis for this limitation in the claim. This is due to a simple typographical error (steam instead of stream) and will be overcome when the spelling is corrected.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 2, 5, 8, and 9 are rejected under 35 U.S.C. 102(b) as being anticipated by Yamaguchi (5282355).

Yamaguchi teaches a process for reducing NOx in an exhaust gas stream (see Figure 1 and Columns 3-4, lines 40-20) including contacting a side stream (16) with aqueous ammonia or its precursor (Column 2, lines 57-62) to form a vapor of it (Columns 3-4, lines 65-2), introducing the resultant gases into the flu (4) and passing the gaseous mixture though a catalyst to reduce NOx (6). Yamaguchi teaches, with particular respect to claims 1 and 5, that the side stream is at a temperature of 200-600°C (Column 3, line 54), which is at least 140°C and is also at least 200°C, both of which are claimed. Furthermore, with respect to claim 8 particularly, Yamaguchi teaches that the side stream is superheated steam.

With respect to claim 2, Yamaguchi teaches that the side stream is separated from the combustion gas stream (see Figure 1 and Column 3, lines 53-55).

With respect to claim 9, Yamaguchi teaches mixing the side stream and aqueous ammonia or its precursor (17) before spraying (10a) into the primary exhaust gas stream.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

> having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 3, 4, 8, 9, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamaguchi (5282355) as applied to claims 1-2 above.

Yamaguchi teaches the process of reducing NOx in an exhaust gas stream as described with respect to claim 1 above. Although Yamaguchi teaches that the side stream is derived from the combustion gas stream, Yamaguchi also teaches that the side stream is not necessarily limited to that derived from the exhaust but may come from any source so long as it is at the predetermined necessary temperature and the like (Column 4, lines 15-20).

It would have been obvious to modify the process taught by Yamaguchi by using either outside air or gases withdrawn from another point in the process because these gas streams are meet the specified requirements of Yamaguchi that the gas stream may be derived from elsewhere so long as it is the correct temperature.

With respect to claim 13, although Yamaguchi does not specifically teach the exact volume percent of the side stream, it would be obvious that the extracted stream (16) be a small volume fraction of the exhaust stream, such as less than 10%, because Yamaguchi teaches using only enough gas to effect vaporization of ammonia or its precursor (Column 2, lines 57-62).

Claims 6, 7, and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamaguchi (5282355) as applied to claims 1-4 above, and further in view of Peter-Hoblyn et al. (6203770).

Yamaguchi teaches the process of reducing NOx in an exhaust gas stream as described with respect to claim 1 above. Yamaguchi does not teach introducing the urea at a rate to provide

any particular "NSR", defined as the relative equivalents of nitrogen in the urea or other NOx-reducing agent to the equivalents of nitrogen in the NOx in the combustion gases to be treated, nor does Yamaguchi teach what the concentration of the aqueous solution should be.

Peter-Hoblyn et al. teaches a process of reducing NOx in an exhaust gas stream which uses an aqueous solution of urea having about 2 to about 65 % reagent (Column 4, lines 25-28) and in an amount such that the molar ratio active species to baseline nitrogen oxides is about 0.5:1 to about 1:1 (Column 7, lines 22-32).

It would have been obvious to modify the process of Yamaguchi by using an aqueous urea solution in the amount and concentration as taught by Peter-Hoblyn et al. because Yamaguchi is silent as to these parameters and so one of ordinary skill in the art would look to Peter-Hoblyn et al. which teaches these values are effective to reduce NOx in exhaust gases.

Claims 14, 15, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamaguchi (5282355), in view of Peter-Hoblyn et al. (6203770).

With respect to claim 14, Yamaguchi teaches a process for reducing NOx in an exhaust gas stream (see Figure 1 and Columns 3-4, lines 40-20) including contacting a side stream (16) with aqueous ammonia or its precursor (Column 2, lines 57-62) to form a vapor of it (Columns 3-4, lines 65-2), introducing the resultant gases into the flu (4) and passing the gaseous mixture though a catalyst to reduce NOx (6). Yamaguchi teaches that the side stream is at a temperature of 200-600°C (Column 3, line 54), which is at least 140°C and is also at least 200°C, both of which are claimed. Although Yamaguchi does not specifically teach the exact volume percent of the side stream, it would be obvious that the extracted stream (16) be a small volume fraction of

the exhaust stream, such as less than 10%, because Yamaguchi teaches using only enough gas to effect vaporization of ammonia or its precursor (Column 2, lines 57-62).

Yamaguchi does not teach introducing the urea at a rate to provide any particular "NSR", defined as the relative equivalents of nitrogen in the urea or other NOx-reducing agent to the equivalents of nitrogen in the NOx in the combustion gases to be treated, nor does Yamaguchi teach what the concentration of the aqueous solution should be.

Peter-Hoblyn et al. teaches a process of reducing NOx in an exhaust gas stream which uses an aqueous solution of urea having about 2 to about 65 % reagent (Column 4, lines 25-28) and in an amount such that the molar ratio active species to baseline nitrogen oxides is about 0.5:1 to about 1:1 (Column 7, lines 22-32).

It would have been obvious to modify the process of Yamaguchi by using an aqueous urea solution in the amount and concentration as taught by Peter-Hoblyn et al. because Yamaguchi is silent as to these parameters and so one of ordinary skill in the art would look to Peter-Hoblyn et al. which teaches these values are effective to reduce NOx in exhaust gases.

With respect to claim 15, Yamaguchi teaches a process for reducing NOx in an exhaust gas stream (see Figure 1 and Columns 3-4, lines 40-20) including contacting a side stream (16) with aqueous ammonia or its precursor (Column 2, lines 57-62) to form a vapor of it (Columns 3-4, lines 65-2), introducing the resultant gases into the flu (4) and passing the gaseous mixture though a catalyst to reduce NOx (6). Yamaguchi teaches that the side stream is at a temperature of 200-600°C (Column 3, line 54), which is at least 140°C and is also at least 200°C, both of which are claimed. Although Yamaguchi teaches that the side stream is derived from the

combustion gas stream, Yamaguchi also teaches that the side stream is not necessarily limited to that derived from the exhaust but may come from any source so long as it is at the predetermined necessary temperature and the like (Column 4, lines 15-20). Although Yamaguchi does not specifically teach the exact volume percent of the side stream, it would be obvious that the extracted stream (16) be a small volume fraction of the exhaust stream, such as less than 10%, because Yamaguchi teaches using only enough gas to effect vaporization of ammonia or its precursor (Column 2, lines 57-62).

Yamaguchi does not teach introducing the urea at a rate to provide any particular "NSR", defined as the relative equivalents of nitrogen in the urea or other NOx-reducing agent to the equivalents of nitrogen in the NOx in the combustion gases to be treated, nor does Yamaguchi teach what the concentration of the aqueous solution should be.

Peter-Hoblyn et al. teaches a process of reducing NOx in an exhaust gas stream which uses an aqueous solution of urea having about 2 to about 65 % reagent (Column 4, lines 25-28) and in an amount such that the molar ratio active species to baseline nitrogen oxides is about 0.5:1 to about 1:1 (Column 7, lines 22-32).

It would have been obvious to modify the process of Yamaguchi by using an aqueous urea solution in the amount and concentration as taught by Peter-Hoblyn et al. because Yamaguchi is silent as to these parameters and so one of ordinary skill in the art would look to Peter-Hoblyn et al. which teaches these values are effective to reduce NOx in exhaust gases.

With respect to claim 16, Yamaguchi teaches a process for reducing NOx in an exhaust gas stream (see Figure 1 and Columns 3-4, lines 40-20) including contacting a side stream (16)

with aqueous ammonia or its precursor (Column 2, lines 57-62) to form a vapor of it (Columns 3-4, lines 65-2), introducing the resultant gases into the flu (4) and passing the gaseous mixture though a catalyst to reduce NOx (6). Yamaguchi teaches that the side stream is at a temperature of 200-600°C (Column 3, line 54), which is at least 140°C and is also at least 200°C, both of which are claimed. Although Yamaguchi does not specifically teach the exact volume percent of the side stream, it would be obvious that the extracted stream (16) be a small volume fraction of the exhaust stream, such as less than 10%, because Yamaguchi teaches using only enough gas to effect vaporization of ammonia or its precursor (Column 2, lines 57-62).

Yamaguchi does not teach introducing the urea at a rate to provide any particular "NSR", defined as the relative equivalents of nitrogen in the urea or other NOx-reducing agent to the equivalents of nitrogen in the NOx in the combustion gases to be treated, nor does Yamaguchi teach what the concentration of the aqueous solution should be.

Peter-Hoblyn et al. teaches a process of reducing NOx in an exhaust gas stream which uses an aqueous solution of urea having about 2 to about 65 % reagent (Column 4, lines 25-28) and in an amount such that the molar ratio active species to baseline nitrogen oxides is about 0.5:1 to about 1:1 (Column 7, lines 22-32).

It would have been obvious to modify the process of Yamaguchi by using an aqueous urea solution in the amount and concentration as taught by Peter-Hoblyn et al. because Yamaguchi is silent as to these parameters and so one of ordinary skill in the art would look to Peter-Hoblyn et al. which teaches these values are effective to reduce NOx in exhaust gases.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamaguchi (5282355) as applied to claims 1-4 above, and further in view of Tarabulski et al. (6063350).

Yamaguchi teaches the process of reducing NOx in an exhaust gas stream as described with respect to claim 1 above. Yamaguchi teaches mixing the side stream and aqueous ammonia or its precursor (17) before spraying (10a) into the primary exhaust gas stream; Yamaguchi is silent as to the specific device used.

Tarabulski et al. teaches that when using a urea solution, in-line mixing means are preferably used, especially when using certain injectors (Column 7, lines 49-51).

It would have been obvious to modify Yamaguchi by employing in-line mixers as taught by Tarabulski et al. because Tarabulski et al. teaches that distribution is important to avoid water droplets or particles of urea or pyrolysis (Column 7, lines 52-55).

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamaguchi as applied to claims 1-4 above, and further in view of Cohen et al. (5294409).

Yamaguchi teaches the process of reducing NOx in an exhaust gas stream as described with respect to claim 1 above. Yamaguchi does not teach any particulate removal means.

Cohen et al. teaches a process of reducing NOx in an exhaust gas stream which has particulates, wherein the exhaust gas stream (16) is passed through a particulate matter removal device (4) upstream of the reactor (Column 4, lines 60-63 generally and Column 10, lines 50-58).

It would have been obvious to modify Yamaguchi by including a particulate removal means because Yamaguchi is concerned with treatment of exhaust gases discharged from a gas turbine, diesel engine, gas engine, boiler, heating furnace, etc. (Column 1, lines 10-13) and

Cohen et al. teaches that the exhaust gas from combustion of coal, fuel and the like contains particulate matter and nitrogen oxides which pollute the environment (Column 1, lines 20-24).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Colleen P Cooke whose telephone number is 571-272-1170. She can normally be reached Mon.-Thurs. 8am-6:30pm.

If attempts to reach the examiner by telephone are unsuccessful, her supervisor, Stan Silverman can be reached at 571-272-1358. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Colleen P. Cooke 6/6/05

Colleen P Cooke
Primary Examiner
Art Unit 1754